GYPSY MOTH SUPPRESSION IN THE NORTHEAST

Summary of the Treatment Monitoring Data Base, 1989-1990

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NORTHEASTERN AREA
State and Private Forestry

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West Virginia Department of Agriculture
Vermont Department of Forests, Parks, and Recreation

Notice: Dimilin 25W, Dipel 8L, Dipel 8AF, Foray 48B, and SAN 415 are tradenames. Use of these names does not necessarily mean endorsement by the USDA Forest Service.

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NORTHEASTERN AREA
State and Private Forestry

Introduction

The Treatment Monitoring Data Base (TMDB) was implemented in 1986 in order to develop information about gypsy moth suppression effectiveness. It is a cooperative effort among participating State agencies and the USDA Forest Service. The TMDB was developed to 1) provide information about the results of operational projects, and 2) provide information about conditions leading up to those results. TMDB offers a way to quantify and compare project effectiveness both within and among projects.

Part of the usefulness of TMDB lies in record-keeping and data summary aspects. Aerial application projects are very complex, requiring attention to numerous factors. The TMDB provides a way to track variables that may be related to project results or are needed to summarize project operations.

The TMDB contains data spanning 6 years and over 4,000 treatment blocks in 8 States and 2 National Forests. The data base includes information about the treatment blocks, treatment materials, conditions during treatment, aircraft, and results.

This is the second report on suppression effectiveness among USDA-State cooperative projects and summarizes 2 years of the TMDB, 1989-1990. The first report included the years 1986 to 1988 (Gypsy moth Suppression in the Northeast--A 3-Year Summary of the Treatment Monitoring Data Base, USDA Forest Service, Northeastern Area State and Private Forestry, Forest Pest Management, Morgantown, WV 26505 (NA-TP-18) by D. Twardus and H. Machesky.

Methods

The TMDB provides a data collection format for each project (see Appendix 1 for examples). This is the same type of data used in conjunction with the operational conduct of each project. The TMDB does not have experimental design other than as a broadly-based survey of activities. Non-treated check blocks are not a part of TMDB.

The primary survey unit in this analysis is the treatment block, a variable sized area designated by State or Forest Service personnel as an area to be treated with an insecticide. Treatment blocks included in the data base are selected by each project. In some projects, all or nearly all treatment blocks are represented in the TMDB while in other projects only a portion of the total number of blocks treated are represented. The amount of data collected from each treatment block also varies depending upon the personnel constraints of each project. To be included in the TMDB, post-treatment data must be collected.

Egg mass survey estimates reported here are based both upon 1/40th-acre fixed size plots and timed walks (Eggen and Abrahamson, 1983). The number of walks or plots used to estimate egg mass density varies among projects and is known, but not reported here. Timed walk estimates were used in Delaware and West Virginia. Statistics associated with egg mass density estimates were not calculated.

Information about larval instar development, foliage development, and foliage conditions are also provided by observations made from within each treatment block. Guides for treatment monitoring data collection are provided to each project in order to help improve the reliability and comparability of data collection. Meterological data, such as windspeeds, temperatures, and relative humidities, are obtained by project personnel from on-site estimates. Post-treatment defoliation estimates are obtained from aerial surveys conducted by each project. Defoliation estimates are the results of aerial sketch map surveys after treatment and are averages for the entire block.

Product data contained in this report includes:

Product	No. of Blocks	Average Block Size (acres)
B.t.		
Dipel 8L (Abbott Labs)	641	200
Dipel 8AF (Abbott Labs)	356	259
SAN 415 (Sandoz)	489	138
Foray 48B (Novo)	357	207
Dimilin 25W (Duphar)	1,982	235

Results are reported here for cooperative suppression projects in Delaware, New Jersey, Maryland, Virginia, Vermont, West Virginia, and Pennsylvania. Post-treatment egg mass data were not available for the Pennsylvania project.

Results and Discussion

Analysis in this report is based upon 1) population reduction as measured by a comparison of pre-treatment and post-treatment egg mass estimates, and 2) project success as measured by egg mass reduction to below 500 egg masses per acre (em/ac), or preventing defoliation in excess of 30 percent, averaged for the block. These are project objectives that apply to most cooperative projects (see Appendix 2).

Population Reduction - Dimilin

Table 1 and Figure 1 in Appendix 3 shows pre-treatment egg mass density categories for the Dimilin 25W blocks. Overall, 1,850 blocks are represented in this summary of Dimilin 25W, and in 94 percent of these blocks, egg mass densities were reduced an average 90 percent from pre-treatment. In the remaining 6 percent, egg mass densities increased an average 194 percent. Table 1 can be summarized by State as follows:

Project	Total No. of Dimilin Blocks	Percent of Total Blocks with Population Decrease	Average Population Reduction where Egg Mass Densities Decreased
Delaware	201	79	91
Maryland	982	94	91
Virginia	204	98	81
West Virginia	463	97	96

Post-treatment egg mass densities are further summarized by the following tabulation which shows percent of Dimilin treated blocks that have post-treatment egg mass densities below specified thresholds (250 em/ac and 500 em/ac). For example, there are 191 blocks that have a pre-treatment egg mass density in the 0-500 range. Of these, post-treatment egg mass densities increased in 46 of the blocks and decreased in 145. In terms of reducing egg mass densities to below a specified threshold, the Dimilin treatment resulted in success for blocks in this pre-treatment range 75 percent and 76 percent of the time for 250 and 500 egg masses per acre, respectively. The results are similarly interpreted for the remaining pre-treatment egg mass categories.

			Percent of Total No. of Blocks		
Pre-trt. Egg Mass Category	No. of Blocks with Egg Mass Increase	No. of Blocks with Egg Mass Decrease	Total No. of Blocks	Decreased to < 250 em/ac	Decreased to < 500 em/ac
0-500	46	145	191	75%(143)	76%(145)
501-2500	51	792	843	77%(649)	86%(726)
2501+	22	794	816	67%(548)	75%(615)

Population Reduction - *B.t.*

Population reduction results for *B.t.*-treated blocks are summarized in this section. The following tabulation shows Dipel 8AF for two BIU rates--16 and 20 BIU. The 20 BIU results show a much higher percent of blocks reduced to below 500 egg masses per acre than the 16 BIU results. Note that above the 2,500 egg masses per acre pre-treatment category, percent of blocks reduced to below 500 egg masses per acre is low for both 16 and 20 BIU treatments.

Dipel 8AF

			Percent of Total No. of Blocks		
Pre-trt. Egg Mass Category	**No. of Blocks with Egg Mass Increase**	**No. of Blocks with Egg Mass Decrease**	**Total No. of Blocks**	**Decreased to < 250 em/ac**	**Decreased to < 500 em/ac**
			---16 BIU---		
0-500	6	7	13	46%(6)	54%(7)
501-2500	41	67	108	27%(29)	38%(42)
2501+	26	79	105	17%(18)	26%(27)
			---20 BIU---		
0-500	2	10	12	83%(10)	83%(10)
501-2500	2	12	14	79%(11)	79%(11)
2501+	3	17	20	25%(5)	65%(13)

Results for Dipel 8L are shown in the following tabulation. Note that the results are simliar to the Dipel 8AF results.

Dipel 8L

				Percent of Total No. of Blocks	
Pre-trt. Egg Mass Category	**No. of Blocks with Egg Mass Increase**	**No. of Blocks with Egg Mass Decrease**	**Total No. of Blocks**	**Decreased to < 250 em/ac**	**Decreased to < 500 em/ac**
		---16 BIU---			
0-500	40	12	52	15%(8)	23%(12)
501-2500	75	83	158	23%(37)	33%(53)
2501+	22	58	80	23%(18)	25%(20)
		---20 BIU---			
0-500	18	45	63	66%(42)	71%(45)
501-2500	3	18	21	62%(13)	86%(18)
2501+	1	1	2	50%(1)	50%(1)

Foray 48B results are below for 16, 20, and 24 BIU rates. Success in reducing egg masses per acre to below 500 egg masses per acre is again better when pre-treatment egg masses per acre are below 2,500 egg masses/acre.

Foray 48B

Pre-trt. Egg Mass Category	No. of Blocks with Egg Mass Increase	No. of Blocks with Egg Mass Decrease	Total No. of Blocks	Percent of Total No. of Blocks: Decreased to < 250 em/ac	Percent of Total No. of Blocks: Decreased to < 500 em/ac
			---16 BIU---		
0-500	2	30	32	88%(28)	94%(30)
501-2500	6	97	103	75%(77)	86%(89)
2501+	2	112	114	47%(54)	55%(63)
			---20 BIU---		
0-500	13	27	40	63%(25)	68%(27)
501-2500	2	14	16	63%(10)	81%(13)
2501+	-	-	-	-	-
			---24 BIU---		
0-500	-	-	-	-	-
501-2500	0	11	11	92%(11)	92%(11)
2501+	0	38	38	47%(18)	74%(28)

SAN 415 results are displayed below. Note that results do not indicate better success at higher BIU rates, but there are fewer block numbers at the 24 BIU rate.

SAN 415

Pre-trt. Egg Mass Category	No. of Blocks with Egg Mass Increase	No. of Blocks with Egg Mass Decrease	Total No. of Blocks	Percent of Total No. of Blocks: Decreased to < 250 em/ac	Percent of Total No. of Blocks: Decreased to < 500 em/ac
			---12 BIU---		
0-500	18	18	36	50%(18)	50%(18)
501-2500	101	146	247	37%(92)	48%(119)
2501+	50	67	117	16%(19)	19%(22)
			---16 BIU---		
0-500	-	-	-	-	-
501-2500	9	22	31	32%(10)	45%(14)
2501+	2	32	34	18%(6)	18%(6)
			---24 BIU---		
0-500	-	-	-	-	-
501-2500	2	9	11	55%(6)	64%(7)
2501+	0	10	10	30%(3)	40%(4)

Tables 2-5 and Figures 2-5 in Appendix 3 show population reduction results for *B.t.* products used in 1989-1990. These data are summarized below by project showing percent of blocks treated that resulted in a post-treatment egg mass density decrease. Numbers in parenthesis are number of blocks. For example, in Maryland, Dipel 8AF at 16 BIU's resulted in 153 blocks where egg mass densities decreased from the pre-treatment density. This 153 is 68 percent of the total number of Dipel 8AF 16 BIU blocks in Maryland. The average percent reduction for these 153 blocks is 72 percent.

Formulation	State						Avg. Pct. Reduction**
	DE	MD	NJ Ag	NJ For	VA	VT	
Dipel 8AF							
16 BIU	-	68%(153)	-	-	-	-	72%(153)
20 BIU	-	-	81%(30)	100%(9)	-	-	90%(39)
Dipel 8L							
16 BIU	-	53%(153)	-	-	-	-	65%(153)
20 BIU	85%(58)	-	-	37%(6)	-	-	79%(64)
Foray 48B							
16 BIU	-	97%(190)	-	-	91%(49)	-	87%(239)
20 BIU	73%(41)	-	-	-	-	-	73%(41)
24 BIU	-	-	-	-	-	100%(39)	95%(39)
San 415							
12 BIU	-	58%(231)	-	-	-	-	78%(231)
16 BIU	-	83%(54)	-	-	-	-	76%(54)
20 BIU	-	90%(19)	-	-	-	-	78%(19)

**Percent reduction is ((pre-treatment - post-treatment) / pre-treatment) X 100.

With the exception of SAN 415, higher BIU application rates resulted in higher percent population reduction. And in general, success in reducing egg mass densities to below a threshold is greater when pre-treatment populations are below 2,500 egg masses per acre.

Foliage Protection

Foliage protection results are shown in the following tabulation, where success is defined as preventing average defoliation in the treatment block greater than 30 percent. Overall, success rates in terms of numbers of treatment blocks meeting this criteria, are comparable for both Dimilin and all *B.t.* products.

Formulation	Defoliation Category	No. of Blocks	Average Percent Defoliation
Dimilin 25W	> 30 percent	227	57
	< 30 percent	1654	1
Dipel 8AF	> 30 percent	101	51
	< 30 percent	255	3
Dipel 8L	> 30 percent	87	60
	< 30 percent	549	4
Foray 48B	> 30 percent	53	51
	< 30 percent	268	1
SAN 415	> 30 percent	129	56
	< 30 percent	304	0

Table 6, also in Appendix 3, lists these same results for each project and insecticide. Dimilin results are consistently good among projects. Foray 48B and Dipel 8L results are consistently good, while Dipel 8AF and SAN 415 results are less consistent among the projects. Among projects, foliage protection success rates for all *B.t.* products combined are:

State	Percent Success	No. of blocks which meet defoliation prevention criteria
Maryland	74	1159
New Jersey	74	103
Pennsylvania	85	75
Delaware	97	126
Virginia	98	43
Vermont	96	25

Summary

Population Reduction

Overall, 96 percent of all Dimilin treated blocks resulted in some population decrease. Reducing egg mass densities to below 500 egg masses per acre was achieved in 80 percent of all Dimilin blocks.

Overall, for *B.t.* products, 69 percent of the blocks treated resulted in some population decrease. Reducing egg mass densities to below 500 egg masses per acre was achieved in 60 percent of all B.t. blocks. Generally, better results are found with higher BIU rates (20 and 24) of application, except at higher pre-treatment egg mass densities (above 2,500 egg masses per acre).

Foliage Protection

Among all projects, there was a 98 percent success rate for Dimilin treated blocks, and an 89 percent success rate for *B.t.*-treated blocks.

APPENDIX 1

GYPSY MOTH TREATMENT MONITORING

A. BLOCK INFORMATION

STATE	COUNTY	BLOCK NUMBER	BLOCK ACRES	LOWEST ELEVATION (FT.)	HIGHEST ELEVATION (FT.)	ASPECT	OWNERSHIP
				1 0-500	1 0-500	N NORTH	P PRIVATE
				2 501-1000	2 501-1000	E EAST	S STATE
				3 1001-2000	3 1001-2000	S SOUTH	N NATIONAL FOREST
				4 2001+	4 2001+	W WEST	O OTHER
						N NONE	

B. PRE-TREATMENT SURVEY

WAS BLOCK TREATED LAST YEAR?	EGG MASS PER ACRE	EGG MASS SIZE	SURVEY TYPE	NO. OF WALKS/ PLOTS	POPULATION	QUALITY	AVG. PCT. EGG MASS VIABILITY	OLD EGG MASSES AS A PERCENT OF TOTAL
Y YES		D DIME	5 5 MINUTE WALK					1 0
N NO		N NICKEL	F FIXED					2 <5
U UNK		Q QUARTER	F FV					3 5-10
			O OTHER					4 11-20
								5 21-50
								6 >50

C. ON-SITE MONITORING

MATERIAL BEING APPLIED	I F B T	BIU	APP. RATE OZ/AC.	APPLICATION START DATE MO DAY YR	MOST OF APPLICATION OCCURRED DURING (SELECT ONE)	AIRCRAFT TAIL NUMBER	AIRCRAFT TAIL NUMBER
D DIMILIN	D DILUTED				1 DAWN - 9:00 am	N	N
B BT	U UNDILUTED				2 9:01 am - 12:00 noon		
O OTHER, SPECIFY IN COMMENTS					3 12:01 pm - 3:00 pm		
					4 3:01 pm - 6:00 pm		
					5 6:01 pm - DUSK		
					6 ALL DAY		
					7 MORE THAN 1 DAY		

PCT. DEF. ON PRINCIPAL SPECIES	PERCENT FOLIAGE EXPANSION (OAKS)	FOLIAGE CONDITION	PREDOMINANT LARVAL INSTAR	WIND SPEED MPH	TEMP. DEG. F.	PERCENT RELATIVE HUMIDITY	SPRAY DEPOSIT OBSERVED TO BE	MORE THAN ½" OF RAIN WITHIN 24 HOURS
		W WET	1 1ST				G GOOD	Y YES
		D DRY	2 2ND				P POOR	N NO
		U UKN	3 3RD				U UNKN	U UNK
			4 4TH					
			5 5TH					
			6 6TH					

COMMENTS: Y

CP50-1195

GYPSY MOTH TREATMENT MONITORING

STATE	COUNTY	BLOCK NUMBER

NOTE: IF YOU ARE ONLY RECORDING POST-TREATMENT SURVEY INFORMATION, YOU MUST ENTER STATE, COUNTY, AND BLOCK NUMBER; OTHERWISE, PLEASE LEAVE BLANK.

D. POST-TREATMENT SURVEY

ONLY ONE SURVEY TYPE IS REQUIRED

DEFOLIATION

AVG. PCT DEFOLIA. ON PRINCIPAL SPECIES	DEFOLIA. OVER WHAT PERCENT OF BLOCK	SURVEY TYPE
	(0) 0	(A) AERIAL
	(1) 1-25	(G) GROUND
	(2) 26-50	(P) PHOTO
	(3) 50+	

EGG MASS COUNTS

EGG MASSES PER ACRE	EGG MASS SIZE	SURVEY TYPE	NO. OF WALKS/ PLOTS
	(D) DIME	(5) 5 MINUTE WALK	
	(N) NICKEL	(F) FIXED	
	(Q) QUARTER	(F) FV	
		(O) OTHER	

BARK FLAPS

LARVAL DEN. EST. FROM BARK FLAPS	NO OF BARK FLAPS/ BLOCK

GYPSY MOTH SITE SPECIFIC ANALYSIS

A. BLOCK INFORMATION

TODAY'S DATE MON	DAY	YEAR	COUNTY	BLOCK NO.	QUAD	OWNERSHIP
						PRIVATE
						STATE
						NATIONAL FOREST
						OTHER FEDERAL

B. PRE-TREATMENT SURVEY

WAS BLOCK TREATED LAST YEAR?	EM/ACRE	EGG MASS SIZE	EM LENGTH (MM)	1/40 th ACRE PLOTS
YES		DIME		
NO		NICKEL		
UNK		QUARTER		

C. SITE SPECIFIC ANALYSIS

FORESTED ACRES	PERCENT COVER	PERCENT PREFERRED HOST	TOTAL NO. DWELLINGS	NO. PERMANENT DWELLINGS

ELEVATION	OPEN WATER IN BLOCK?	OPEN WATER ADJACENT TO BLOCK?
0-1000 ft.	YES	YES
1001-2000	NO	NO
2001-3000	UNK	UNK
3000 +		

ASPECT	PROXIMITY OF A SCHOOL	PROPOSED INSECTICIDE
NORTH	W/IN BLOCK	DIMILIN
EAST	ADJACENT	B. T.
SOUTH	UNK	OTHER, SPECIFY BELOW
WEST		

D. AIRCRAFT HAZARDS

ARE THERE

	AIRPORT	POWER	LINES	ANTENNA	STEEP	TERRAIN
W/IN BLOCK						
ADJ.						
NO						
UNKN						

E. AREA LEVEL AND TYPE DESIGNATION

EGG MASS DENSITY	PREVIOUS YEAR'S DEFOLIATION	PUBLIC RECREATION AREA	DWELLINGS PER 25 ACRES	PUBLIC RESERVOIR	SPECIAL AREA	AREA LEVEL AND BLOCK CATEGORIES
GTE 250 EGG MASSES PER ACRE	GTE 30%	YES				A
		NO	5 +			C
			1-4			E
			LT 1	YES		G
				NO	YES	I
					NO	K
HIGH LEVEL	LT 30%	YES				B
		NO	5 +			D
			1-4			F
			LT 1	YES		H
				NO	YES	J
					NO	L

EGG MASS DENSITY	PREVIOUS YEAR'S DEFOLIATION	PUBLIC RECREATION AREA	DWELLINGS PER 25 ACRES	PUBLIC RESERVOIR	SPECIAL AREA	AREA LEVEL AND BLOCK CATEGORIES
LT 250 EGG MASSES PER ACRE	GTE 30%	YES				A
		NO	5 +			B
			1-4			C
			LT 1		YES	D
					NO	E
LOW LEVEL	LT 30%					

COMMENTS

VIRGINIA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

FORM PREPARED BY (INITIALS)

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

CP91-1420

F. ON-SITE MONITORING

MATERIAL BEING APPLIED	CODE	IF BT	BIU	APP RATE OZ/AC	APPLICATION START DATE MO	DAY	YR	MOST OF APPLICATION OCCURED DURING (SELECT ONE)
BT	0	DILUTED	0	0	0	0	0	DAWN - 8:00AM
DIMILIN	1	UNDILUTED	1	1	1	1	1	8:01 AM - 10:00 AM
OTHER, SPECIFY BELOW	2		2	2	2	2	2	10:01 AM - 12:00 NOON
	3		3	3	3	3	3	12:01 PM - 2:00 PM
	4		4	4	4	4	4	2:01 PM - 4:00 PM
	5		5	5	5	5	5	4:01 PM - 6:00 PM
	6		6	6	6	6	6	6:01 PM - DUSK
	7		7	7	7	7	7	ALL DAY
	8		8	8	8	8	8	
	9		9	9	9	9	9	

AIRCRAFT 1 TAIL NUMBER	AIRCRAFT 2 TAIL NUMBER
N	N

PCT. DEF. ON PRINCIPAL SPECIES	PERCENT FOLIAGE EXPANSION (OAKS)	FOLIAGE CONDITION	PREDOMINANT LARVAL STAGE	WIND SPEED (MPH)	TEMP DEG. F	PERCENT RELATIVE HUMID.	SPRAY DEPOSIT OBSERVED TO BE	MORE THAN 1/2" OF RAIN W/IN 24 HOURS
0		WET	1				GOOD	YES
1 - 30		DRY	2				POOR	NO
31-60		UNK	3				UNK	UNK
> 60			4					
			5					
			6					

COMMENTS

G. POST-TREATMENT SURVEY

DEFOLIATION

AVG. PCT. DEFOLIATION ON PRINCIPAL SPECIES	SURVEY TYPE (MARK ALL THAT APPLY)
0	AERIAL
1-30	GROUND
31-60	PHOTO
> 60	

EGG MASS COUNTS

AVERAGE EGG MASSES PER ACRE	NO. OF 1/40 TH ACRE PLOTS	EGG MASS SIZE	EGG MASS LENGTH IN (MM)
		DIME	
		NICKEL	
		QUARTER	

COMMENTS

CP92-0186

GYPSY MOTH TREATMENT MONITORING
Pennsylvania Gypsy Moth Suppression Project

A. BLOCK INFORMATION-PRE-TREATMENT SURVEY

STATE	CONTRACT NUMBER	DIST. NO.	COUNTY	BLOCK NUMBER	BLOCK ACRES	WAS BLOCK TREATED LAST YEAR?	EGG MASS PER ACRE	EGG MASS SIZE
						Y YES		< < DIME
						N NO		D DIME
						P PARTIAL		N NICKEL
						U UNK		Q QUARTER
								> > QUARTER

B. ON-SITE MONITORING

MATERIAL BEING APPLIED	CODE	If Bt BIU	If DFB AI	APP RATE OZ/AC.	APPLICATION START DATE MO DAY YR	MOST OF APPLICATION OCCURRED DURING (SELECT ONE)	AIRCRAFT TAIL NUMBER(S)	WIND SPEED MPH	TEMP. DEG. F.	PERCENT RELATIVE HUMIDITY
B Bt						1 DAWN - 9:00 am				
D DIMILIN						2 9:01 am - 12:00 noon				
D OTHER						3 12:01 pm - 3:00 pm				
SPECIFY IN						4 3:01 pm - 6:00 pm				
COMMENTS						5 6:01 pm - DUSK				
						6 ALL DAY				
						7 MORE THAN 1 DAY				
						8 DAWN - NOON				
						9 NOON - 6 PM				

WEATHER SITE	FOLIAGE EXPANSION - PCT. WHITE OAK	O.H.F.S	OVERALL	DEFOLIATION - PCT. WHITE OAK	O.H.F.S	OVERALL	FOLIAGE CONDITION	PREDOMINANT LARVAL INSTAR-PCT. 1ST	2ND	3RD	4TH
L LANDING ZONE							W WET				
B BLOCK							D DRY				
A AREA							U UKN				

SPRAY DEPOSIT OBSERVED TO BE	MORE THAN 1/2" OF RAIN WITHIN 24 HOURS	FREEZE WITHIN 48 HOURS
G GOOD	Y YES	Y YES
P POOR	N NO	N NO
U UNKN	U UNK	U UNK

COMMENTS: Y YES

STATE	CONTRACT NUMBER	DIST. NO.	COUNTY	BLOCK NUMBER

GYPSY MOTH TREATMENT MONITORING

NOTE: IF YOU ARE ONLY RECORDING POST-TREATMENT SURVEY INFORMATION, YOU MUST ENTER STATE, CONTRACT #, DISTRICT, COUNTY, AND BLOCK NUMBER; OTHERWISE, PLEASE LEAVE BLANK.

C. POST-TREATMENT SURVEY

SURVEY TYPE	OBVIOUS BLOCK DELINEATION	DEFOLIATION				EGG MASS COUNTS		ONLY ONE SURVEY TYPE IS REQUIRED
		WHITE OAK	OTHER HIGHLY FAVORED	OVERALL	% OF BLOCK > 30%	EGG MASS PER ACRE	EGG MASS SIZE	
A AERIAL	Y YES						< < DIME	
G GROUND	N NO						D DIME	
P PHOTO							N NICKEL	
							Q QUARTER	
							> > QUARTER	

COMMENTS: Y YES

APPENDIX 2

PROJECT OBJECTIVES FOR USDA-STATE COOPERATIVE GYPSY MOTH SUPPRESSION

Delaware Department of Agriculture

1. To prevent more than 30 percent defoliation on 80 percent or more of the host trees.

2. In areas with Dimilin, to reduce gypsy moth populations below thresholds so that retreatment is not necessary the following year (250 egg masses/acre).

Maryland Department of Agriculture

1. To prevent defoliation from exceeding 30 percent on 80 percent or more of host trees.

2. To reduce gypsy moth populations below certain levels so that treatments would not be required the following year (500 egg masses/acre).

New Jersey Department of Agriculture

1. Prevent defoliation from exceeding 30 percent on 80 percent or more of the host trees in the treated area.

2. Reduce gypsy moth populations in treated areas such that retreatment will not be necessary (500 egg masses/acre).

New Jersey Forest Service

1. Prevent tree defoliation in excess of 40 percent on oak species.

2. Reduce gypsy moth populations by 60 percent compared to pre-treatment levels.

Pennsylvania Bureau of Forestry

1. Prevent defoliation from exceeding 30 percent on 80 percent or more of the host trees.

2. Where Dimilin is used, the objective is to reduce gypsy moth populations below certain levels so that treatments would not be required the following year (250 egg masses/acre for forested residential and public recreation, and 500 egg masses/acre for public forest).

Vermont Department of Forests, Parks, and Recreation

1. To provide foliage protection of at least 70 percent and sufficient larval reduction so that people are able to use areas; and tree mortality is reduced.

2. Subsequent egg masses should be reduced so that retreatment is not necessary

Virginia Department of Agriculture and Consumer Services

1. To prevent tree defoliation greater than 30 percent, thereby reducing the potential for tree mortality

2. To reduce insect populations, thereby reducing the nuisance impact on landowners

3. To reduce population levels to avoid retreatment the following year. Reducing high level gypsy moth populations will minimize the risk of artificial spread into forested areas outside the regulated area. Where chemical insecticides are used, the project will be deemed successful if 70 percent foliage protection and 90 percent population reduction are achieved. Where biological insecticides are used, the project will be considered successful if 70 percent foliage protection and 80 percent population reduction is achieved. A secondary objective is to protect the aesthetic and wildlife resources of Virginia's forestland.

West Virginia Department of Agriculture

1. Minimize adverse impacts on forest resources with egg masses/acre over 500.

2. To preserve aesthetic values.

3. To protect people from annoyance and health problems associated with large numbers of caterpillars (250 egg masses/acre).

4. With respect to egg mass reduction, the objective is to reduce egg mass populations to a level low enough that retreatment will not be necessary for 2 to 3 years.

5. Expect to provide at least 80 percent foliage protection.

Post-treatment results based upon pre-treatment egg mass category - San 415

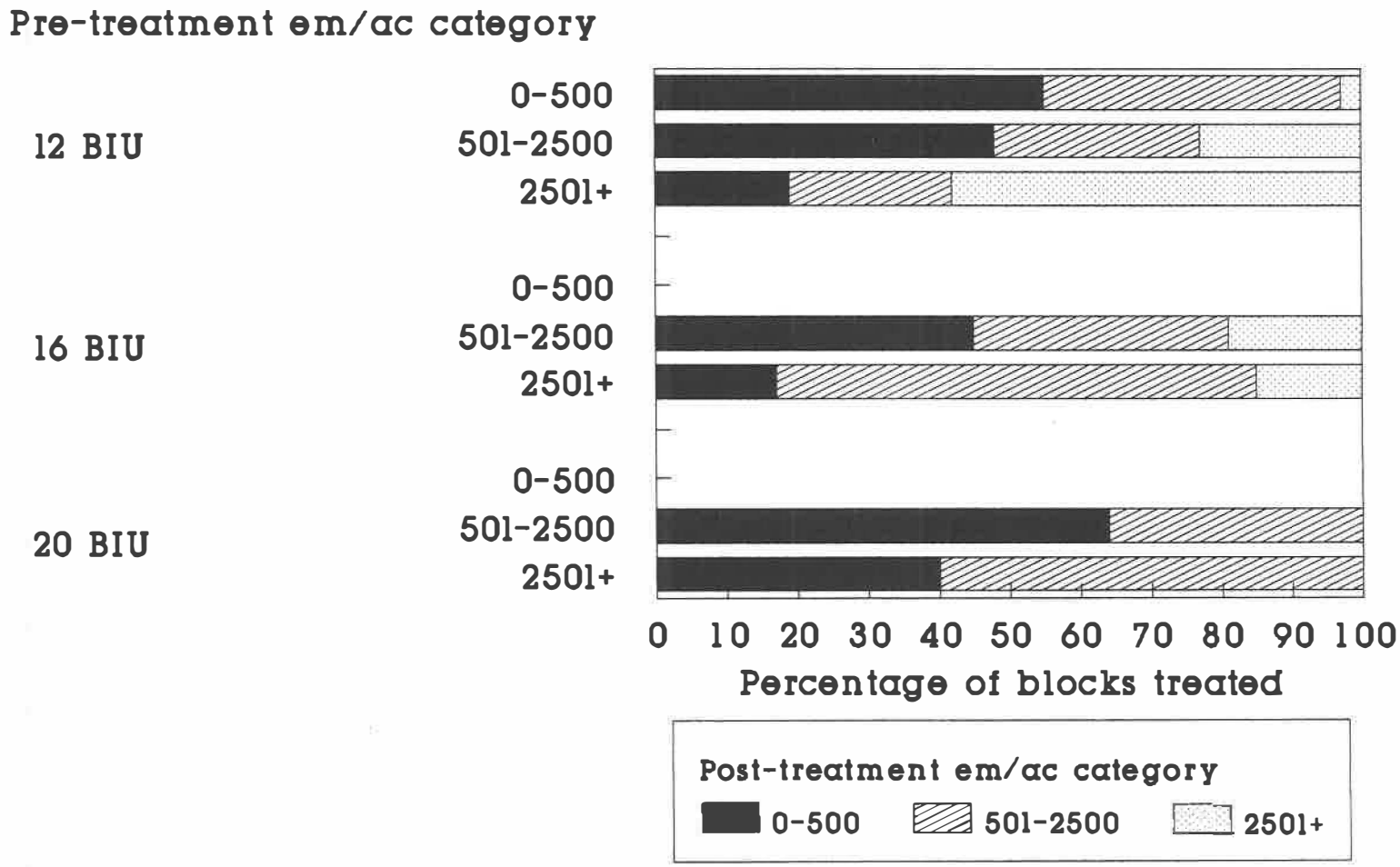

Figure 5

Table 5.--Summary of egg mass density results categorized by pre-treatment egg mass density - SAN 415

State	Change[1]	Pre-Treat. Egg Mass Category	No. of Blocks	Average Pre-Treat. em/ac Den.	Average Post.Treat. em/ac Den.	Percent[2] Reduction
		----------12 BIU----------				
MD	Decrease	0-500	18	306	42	86
		501-2500	146	1348	292	78
		2501+	67	2099	72	72
	Increase	0-500	18	352	1105	-214
		501-2500	101	1155	3407	-195
		2501+	50	4959	10175	-105
		----------16 BIU----------				
MD	Decrease	501-2500	22	1478	384	74
		2501+	32	5339	1156	78
	Increase	501-2500	9	1567	4070	-160
		2501+	2	5035	9855	-96
		----------20 BIU----------				
MD	Decrease	501-2500	9	1390	276	80
		2501+	10	3727	907	76
	Increase	501-2500	2	960	1909	-99

[1]Change relates to post-treatment egg mass density as compared to pre-treatment egg mass density. In Maryland, for example, there are 36 blocks in the 0-500 pre-treatment egg mass density category, 18 of them had a post-treatment egg mass density less than pre-treatment (decrease), and 18 had a post-treatment egg mass density greater than pre-treatment (increase).

[2]Percent reduction is ((pre-treatment - post treatment)/ pre-treatment x 100.

Post-treatment results based upon pre-treatment egg mass category - Foray 48B

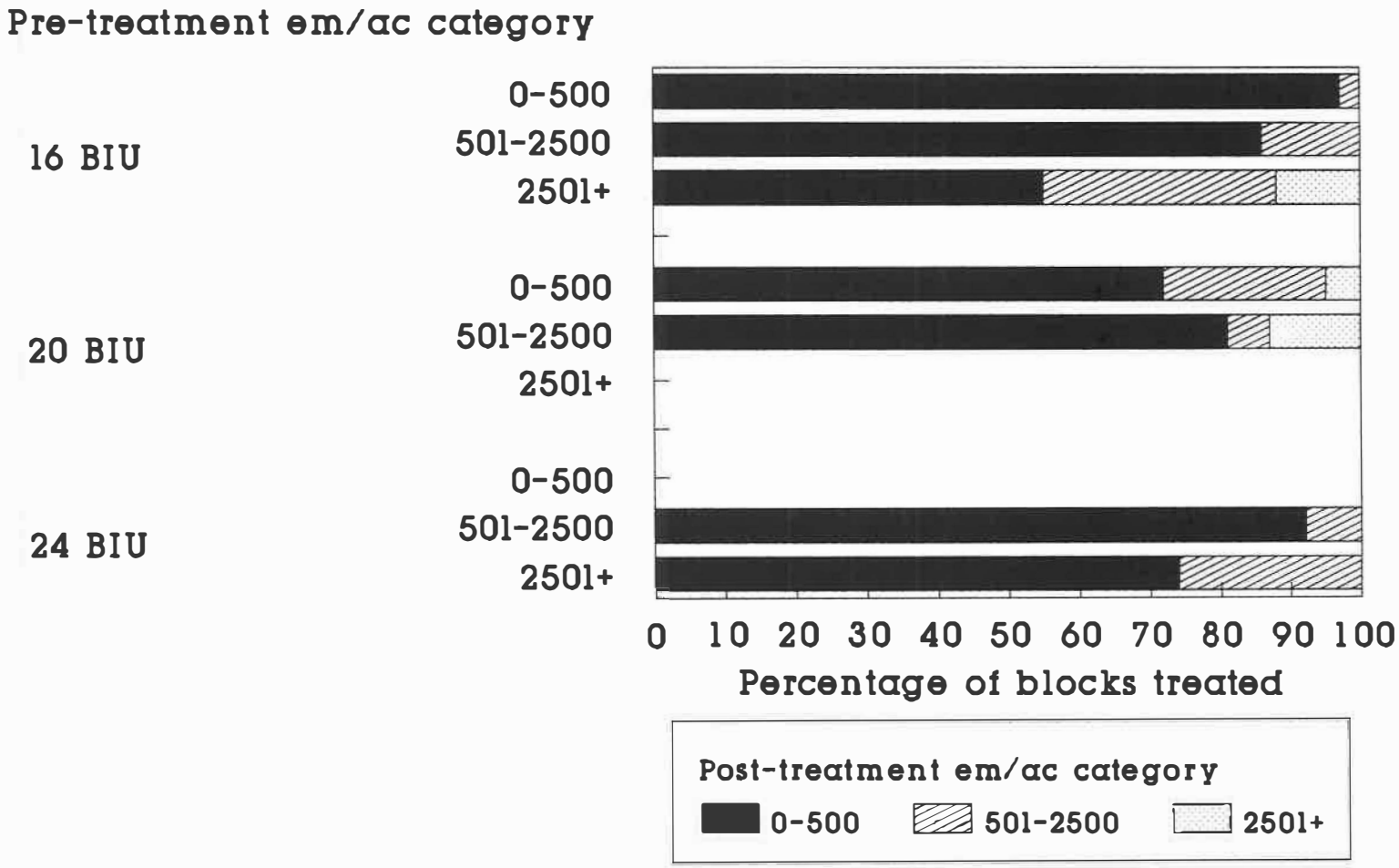

Figure 4

Table 4.--Summary of egg mass density results categorized by pre-treatment egg mass density - Foray 48B

State	Change[1]	Pre-Treat. Egg Mass Category	No. of Blocks	Average Pre-Treat. em/ac Den.	Average Post.Treat. em/ac Den.	Percent[2] Reduction
			----------16 BIU----------			
MD	Decrease	0-500	13	346	32	91
		501-2500	74	1369	161	88
		2501+	103	7832	911	88
	Increase	0-500	1	307	755	-146
		501-2500	3	1561	1988	-27
		2501+	1	3447	5040	-46
VA	Decrease	0-500	17	326	70	79
		501-2500	23	1080	167	85
		2501+	9	740	87	87
	Increase	0-500	1	92	250	-172
		501-2500	3	912	1432	-57
		2501+	1	19260	20000	-4
			----------20 BIU----------			
DE	Decrease	0-500	27	326	47	86
		501-2500	14	764	170	78
	Increase	0-500	13	352	1495	-325
		501-2500	2	760	4211	-454
			----------24 BIU----------			
VT	Decrease	501-2500	11	1245	49	96
		2501+	38	364	94	74

[1]Change relates to post-treatment egg mass density as compared to pre-treatment egg mass density. In Maryland, for example, there are 14 blocks in the 0-500 pre-treatment egg mass density category, 13 of them had a post-treatment egg mass density less than pre-treatment (decrease), and 1 had a post-treatment egg mass density greater than pre-treatment (increase).

[2]Percent reduction is ((pre-treatment - post treatment)/ pre-treatment x 100.

Post-treatment results based upon pre-treatment egg mass category - Dipel 8L

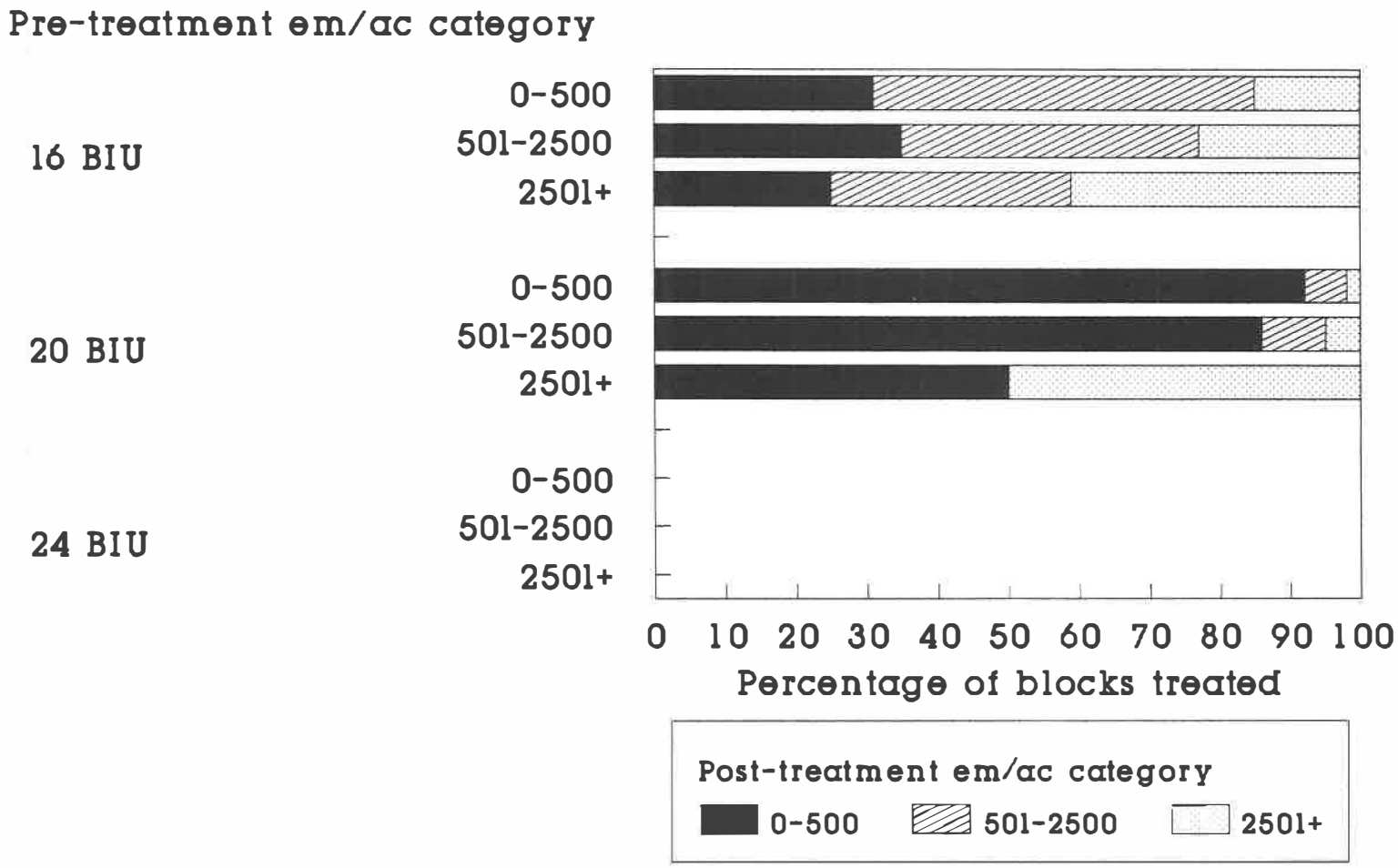

Figure 3

Table 3.--Summary of egg mass density results categorized by pre-treatment egg mass density - Dipel 8L

State	Change[1]	Pre-Treat. Egg Mass Category	No. of Blocks	Average Pre-Treat. em/ac Den.	Average Post.Treat. em/ac Den.	Percent[2] Reduction
			----------16 BIU----------			
MD	Decrease	0-500	12	360	135	62
		501-2500	83	1141	433	62
		2501+	58	5491	1562	72
	Increase	0-500	40	291	2077	-613
		501-2500	75	1161	3533	-204
		2500+	22	6270	15151	-142
			----------20 BIU----------			
DE	Decrease	0-500	42	323	76	77
		501-2500	16	685	152	78
	Increase	0-500	8	328	573	-75
		501-2500	2	981	1194	-22
NJ For	Decrease	0-500	3	275	93	66
		501-2500	2	1000	200	80
		2501+	1	3000	200	93
	Increase	0-500	10	124	1163	-838
		501-2500	1	1000	15000	-1400
		2501+	1	3000	10000	-233

[1]Change relates to post-treatment egg mass density as compared to pre-treatment egg mass density. In Maryland, for example, there are 52 blocks in the 0-500 pre-treatment egg mass density category, 12 of them had a post-treatment egg mass density less than pre-treatment (decrease), and 40 had a post-treatment egg mass density greater than pre-treatment (increase).

[2]Percent reduction is ((pre-treatment - post treatment)/ pre-treatment x 100.

Post-treatment results based upon pre-treatment egg mass category - Dipel 8AF

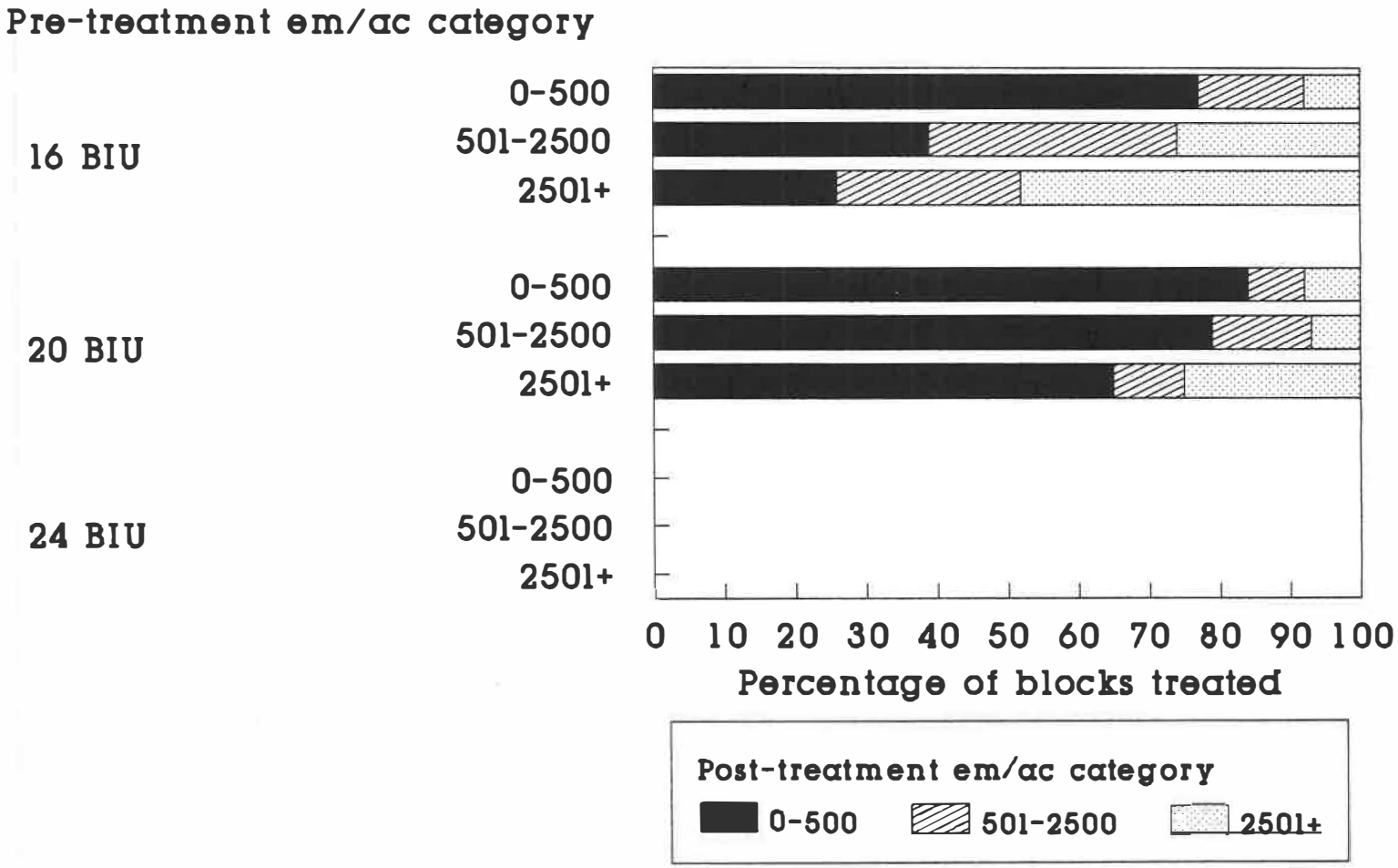

Figure 2

Table 2.--Summary of egg mass density results categorized by pre-treatment egg mass density - Dipel 8AF

State	Change[1]	Pre-Treat. Egg Mass Category	No. of Blocks	Average Pre-Treat. em/ac Den.	Average Post.Treat. em/ac Den.	Percent[2] Reduction
			----------16 BIU----------			
MD	Decrease	0-500	7	369	104	72
		501-2500	67	1424	433	70
		2501+	79	7851	1983	75
	Increase	0-500	6	349	879	-152
		501-2500	41	1352	6058	-348
		2501+	26	5366	8923	-66
			----------20 BIU----------			
NJ Ag	Decrease	0-500	10	500	0	100
		501-2500	9	1457	247	83
		2501+	11	7508	602	92
	Increase	0-500	2	500	0	100
		501-2500	2	1250	5175	-314
		2501+	3	4767	9117	-91
NJ For	Decrease	501-2500	3	1000	133	87
		2501+	6	9667	1067	89

[1]Change relates to post-treatment egg mass density as compared to pre-treatment egg mass density. In Maryland, for example, there are 13 blocks in the 0-500 pre-treatment egg mass density category, 7 of them has a post-treatment egg mass density less than pre-treatment (decrease), and 6 had a post-treatment egg mass density greater than pre-treatment (increase).

[2]Percent reduction is ((pre-treatment - post-treatment)/ pre-treatment x 100.

Post-treatment results based upon pre-treatment egg mass category- Dimilin 25W

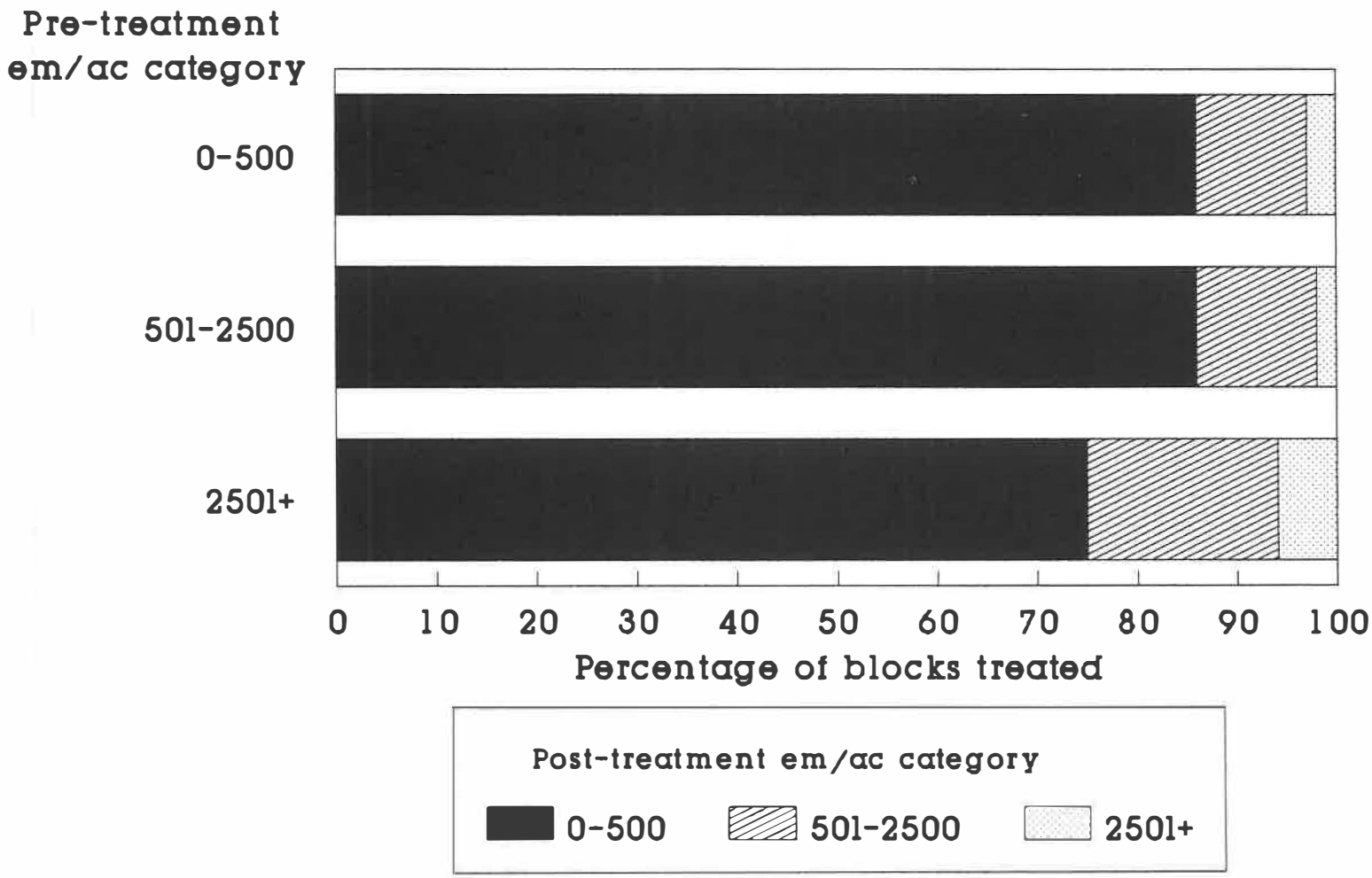

Figure 1

Table 1.--Summary of population reduction results categorized by pre-treatment egg mass density - Dimilin 25W

State	Change[1]	Pre-Treat. Egg Mass Category	No. of Blocks	Average Pre-Treat. em/ac Den.	Average Post.Treat. em/ac Den.	Percent[2] Reduction
DE	Decrease	0-500	74	313	42	87
		501-2500	69	980	141	86
		2501+	16	6662	83	99
	Increase	0-500	30	281	1379	-391
		501-2500	12	844	1705	-102
MD	Decrease	0-500	16	354	30	92
		501-2500	379	1431	154	89
		2501+	529	7663	521	93
	Increase	0-500	4	323	633	-96
		501-2500	33	1384	3506	-153
		2501+	21	4595	8601	-87
VA	Decrease	0-500	7	310	88	72
		501-2500	84	1549	287	81
		2501+	108	4729	413	91
	Increase	501-2500	4	1688	6674	-296
		2501+	1	4280	20000	-367
WV	Decrease	0-500	48	124	1	99
		501-2500	260	1264	86	93
		2501+	141	6053	155	97
	Increase	0-500	12	80	159	-100
		501-2500	2	961	1077	-12

[1]Change category is: Decrease, those blocks where post-treatment egg masses/acre is less than pre-treatment. Increase, those blocks where post-treatment egg masses/acre is greater than pre-treatment. For example, in Delaware there are 104 blocks with pre-treatment egg mass density in the 0-500 pre-treatment category, 74 of them have a post-treatment egg mass density less than pre-treatment (decrease) while 30 have a post-treatment egg mass density greater than pre-treatment (increase).

[2]Percent reduction is ((pre-treatment - post-treatment)/ pre-treatment x 100.

APPENDIX 3